17. (Twice Amended) A process of forming electrically isolated integrated devices in a silicon substrate, comprising:

masking portions of the substrate to define unmasked field isolation regions;

growing field oxide in the field isolation regions without forming silicon nitride inclusions in the field oxide by hydrogen-free oxidation alone at an oxidant partial pressure between about 5 atm and 30 atm and a temperature of greater than about 900°C; and

forming electrical devices between the field isolation regions.

D3

9 14. (Twice Amended) A process of forming an integrated circuit on a semiconductor substrate, comprising:

masking portions of the substrate with a mask comprising silicon nitride;

growing a field oxide in a single process step by hydrogen-free oxidation alone to a thickness sufficient for electrical isolation of devices within the substrate without forming silicon nitride inclusions therein;

removing the mask after growing the field oxide; and

forming a gate oxide of uniform thickness adjacent the field oxide on the semiconductor substrate without performing a prior sacrificial oxidation.

D4

REMARKS

This Preliminary Amendment is an attempt to clarify further the underlying non-obviousness of Applicants' invention. All of the Claims remaining in this application, namely Claims 1-4, 8, 9, 11, 12, 14, 16 and 17, are amended herein, and reconsideration of the rejection is hereby requested.

The crux of the matter is whether German Patent No. DD 266,885 (Germany '885) renders the claims obvious. It is the Examiner's position that, although Germany '885 describes a wet oxidation process followed by a dry oxidation process, it would have been obvious to one of ordinary skill in the art to eliminate the wet oxidation, and do only the dry oxidation portion.

Applicants had understood, after a personal interview between the Examiner and Applicants' counsel, that the addition of the limitation "hydrogen free" in the claims (a phrase suggested by the Examiner) clearly avoided Germany '885, since the "dry oxidation" of that reference uses "dry oxygen to which pref. a small amount of hydrogen chloride or chlorocarbon gas is added..." Thus, since Germany '885 teaches the addition of hydrogen, either as part of the

hydrogen chloride, or as part of the chlorocarbon gas, Applicants believe that the reference teaches away from a hydrogen free process. As a consequence, Applicants were surprised to receive a final rejection of the claims which included the language which the Examiner suggested.

In addition, in the last amendment, Applicants argued that there was no suggestion in Germany '885, or elsewhere in this record, that would make obvious the elimination of the wet oxidation step. The Examiner did not directly respond to this argument, saying only "It would have been within the scope of one of ordinary skill in the art to omit the first stage oxidation with the expectation that the concomitant disclosed advantages of such a step would not be obtained because it appears that the process could be performed without the first stage oxidation, although taking longer." Applicants do not believe that the test of obviousness is whether the process of Germany '885 could be altered to fall within the claims of this application...rather, the test is whether the modification would have been obvious, i.e., whether there is a suggestion somewhere in the art of record to make the modification. Absent such a suggestion, Applicants believe that the claims should be allowed.

On page 2 of the present application, the Applicants acknowledged that two step processes were known for forming a field oxide and then removing silicon nitride inclusions. The present invention is directed at a technique for growing field oxide without creating these inclusions. This invention is the first which recognized that the silicon nitride inclusions are caused by a series of processes which are described in detail at page 4, line 20 through page 5, line 10, and that they may be eliminated by using the processes described at page 6, lines 4 through 18, that is, with a hydrogen-free oxidation. There is no suggestion in Germany '885 that hydrogen is the cause of the silicon nitride inclusions, or that its elimination would eliminate such inclusions. Without such a suggestion, Applicants believe the claims should be allowed.

Nevertheless, the Applicants herein amend the claims to add to each a limitation which requires that the oxidation process forms the field isolation region without forming silicon nitride inclusions in said field isolation region. This, of course, is the goal of the present process. The phenomenon of silicon nitride inclusion was discovered by Kooi (see pg. 2, lines 4-19 of the present specification). This effect is sometimes called the "white ribbon effect." Because wet oxidation has been thought necessary for the speed required for forming the field isolation region, the art has uniformly addressed the "white ribbon effect" by using a sacrificial oxide layer. This is

explained in detail at page 5, lines 11 through 16 of the present application. Thus, a two-step process, namely the formation of a sacrificial oxide layer and its later removal, has been considered necessary in the formation of the isolation region.

Germany '885 is another two step approach for solving the Kooi effect. Here, wet oxidation is followed by dry oxidation to encapsulate the secondary nitride or "white ribbon" (see figure 3C of the present application). This process does not occur without forming silicon nitride inclusions in said field isolation region. Rather, the silicon nitride inclusions are still formed, but they are buried in a necessary, second step. For this reason, the present amendment of the claims is believed to even more clearly avoid the teachings of Germany '885. Note that claim 14 has been amended to explicitly define a single-step process.

Finally, none of the remaining references suggest that a hydrogen-free oxidation at a pressure below 30 ATM would satisfactorily form a field isolation region, while eliminating both a second processing step and silicon nitride inclusions. Applicants therefor request reconsideration of the Examiner's final rejection.

Respectfully submitted,

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Dated: 4/17/00

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